

SCIENCE-X

MODULE -5

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1_How Do Organisms Reproduce ?

INTRODUCTION

Reproduction is a process by which living organisms produce new individuals of their own kind and maintain their existence generation after generation.

Reproduction is not essential to maintain the life of an organism but it is essential to maintain life on earth and perpetuation of species from one generation to another.

Reproduction at its basic level (cellular reproduction) is involved in making similar or dissimilar body designs through the genetic material (DNA) present in the chromosomes of its nucleus.

DNA is the source of information for making proteins. Any change in the information leads to production of different proteins, which ultimately lead to altered body designs.

Basic event in reproduction is production of DNA copies in a reproducing cell. The process is called DNA replication. When the cell divides into two, each new cell gets a copy of each DNA or chromosome along with the whole cellular apparatus.

A Little further 1.1

Why is simply copying DNA in a dividing cell not enough for maintain continuity of life?

Explanation



Because an organized cellular structure (with genetic material) is required to maintaining life processes. So DNA copying must be accompanied by the creation of an additional cellular apparatus otherwise simply copying DNA is not enough to maintain continuity

Complete accuracy in DNA copying leads to two exactly identical cells but any error in duplication can lead to dissimilar cells or variations.

The inbuilt tendency for variations during reproduction forms the basis for evolution.

Variations during reproduction enable the population of a species to get adapted easily to a particular inhabiting place/niche. Hence, reproduction is linked to the stability of populations of species.

Stronger variations are useful for the survival of species over time and enable the organisms to tide over any drastic alterations in their habitats.

	ON YOUR TIPS	
Normally DNA produces working copies in the form of RNAs. RNAs build proteins enzymes and other bio chemicals for formation of living matter		

IMPORTANCE OF REPRODUCTION

(i) Maintenance of the existence :- Organisms are maintaining the existence on the earth since their origin, million years ago only because of reproduction.

(ii) Preservation of species :- Species are preserved because of reproduction. It is possible because reproducing organisms produce new individuals which are very similar to themselves.

(iii) Role in evolution :- Some variations are produced in the new organisms during reproduction which play an important role in evolution.

TYPE OF REPRODUCTION

There are two main methods of reproduction in living organisms.

- (1) Asexual reproduction.
- (2) Sexual reproduction.



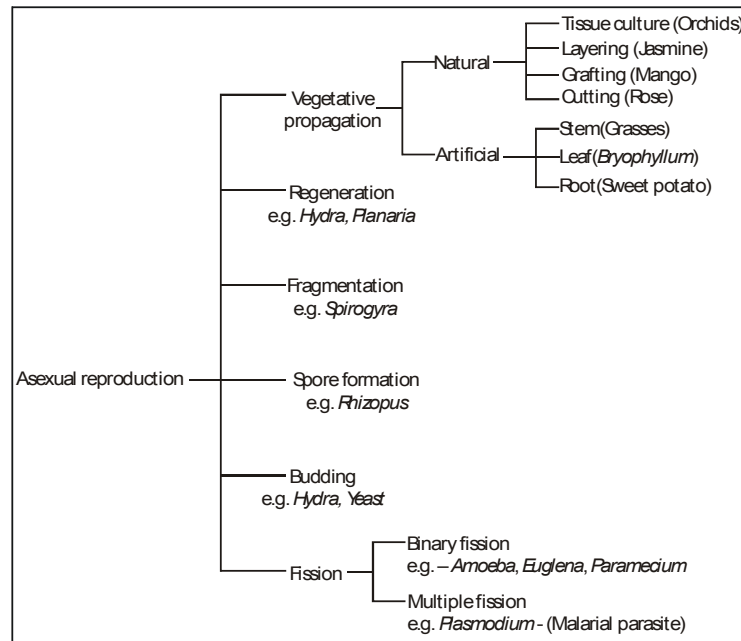
HOW DO ORGANISMS REPRODUCE

(1) Asexual Reproduction :

Production of offsprings by a single parent without the formation and fusion of gametes is called **asexual reproduction**.

It is a primitive type of reproduction in which **offspring** is produced by a cell or any vegetative organ of an organism .

In this type of reproduction **offsprings** are genetically identical to their parents.



	ON YOUR TIPS	
<p>Unicellular organisms never die a natural death, since they never become old. Because before getting old they reproduce to give two cells and become new again</p>		

Modes of asexual reproduction are fission, budding, spore formation, fragmentation, regeneration and vegetative propagation.

(i) Fission.

It is a kind of asexual reproduction in unicellular organisms to create two new individuals. It can be of two types:

(a) **Binary fission.** One cell splits into two equal halves, e.g., many bacteria and protozoa like *Amoeba*, *Paramecium* and *Leishmania*.

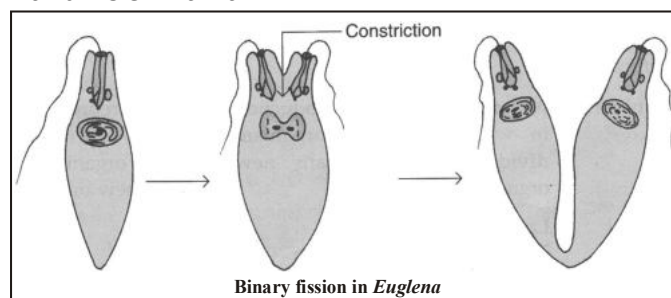


Fig.1

HOW DO ORGANISMS REPRODUCE

A Little further 1.2

Why is it said that Amoeba never dies a natural death

Explanation

Exploiting resources with short-term aims provide immediate advantage that meet current basic human needs.

(b) **Multiple fission.** One cell divides into many daughter cells simultaneously, e.g., *Plasmodium* (malarial parasite), *Amoeba* in unfavourable conditions.

(ii) **Budding :** Process in which an outgrowth (bud) is formed on the body of parent organism which then detaches and become a new organism. **e.g. Yeast and Hydra.**

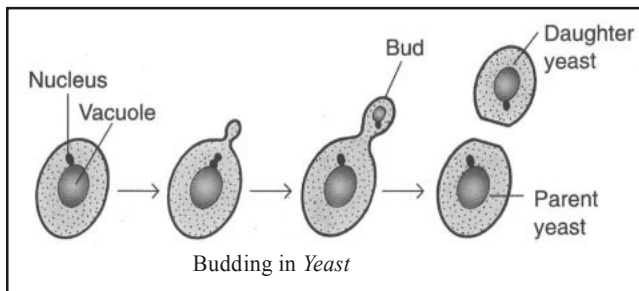


Fig.2

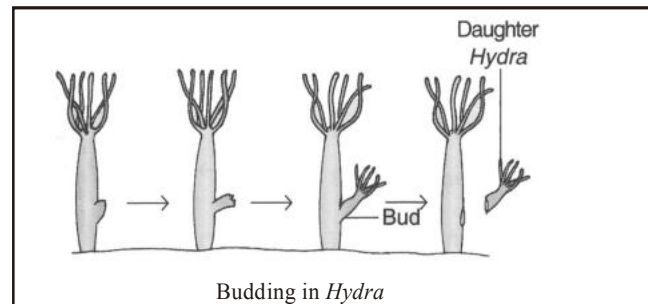


Fig.3

(iii) **Spore formation :** Spores are the microscopic asexual reproductive bodies with a thick wall. Spores are formed in '**sporangium**'.

Each spore on germination give rise to a new organism e.g. ***Rhizopus*, *Penicillium***.

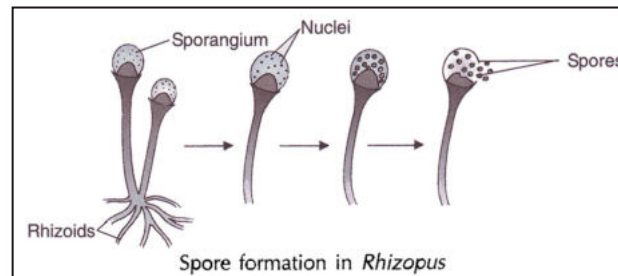


Fig.4

(iv) **Fragmentation :** In this process an organism breaks up into two or more fragments and each fragment develops into an adult organism. e.g. ***Spirogyra***.

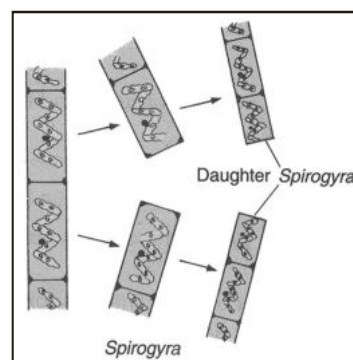




Fig.5

(v) **Regeneration :** The process of getting back a full organism from the body parts of the parent



HOW DO ORGANISMS REPRODUCE

individual is called **regeneration**. Regeneration is carried out by specialised cells. **e.g.** *Hydra*, *Planaria*.

	ON YOUR TIPS	
In fission the organism have lost their parental identity while in budding they have maintained their identity.		

(vi) Vegetative propagation : This is an asexual method of reproduction in plants where vegetative parts namely root, stem and leaves give rise to new plants.

Vegetative propagation is of two types :

- (A) Natural vegetative propagation
- (B) Artificial vegetative propagation.

(A) Natural vegetative propagation :

Plant reproduce without the help of human being.

By leaves : Leaves of some plants produce adventitious buds on their margin. Thus buds develop into new plants e.g. *Bryophyllum*, *Kalanchoe*.

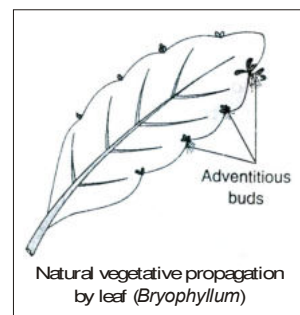


Fig.6

By stem : In many plant, underground stems produce aerial shoots annually under favourable conditions **e.g.** Potato, Zinger, Onion, Grass.

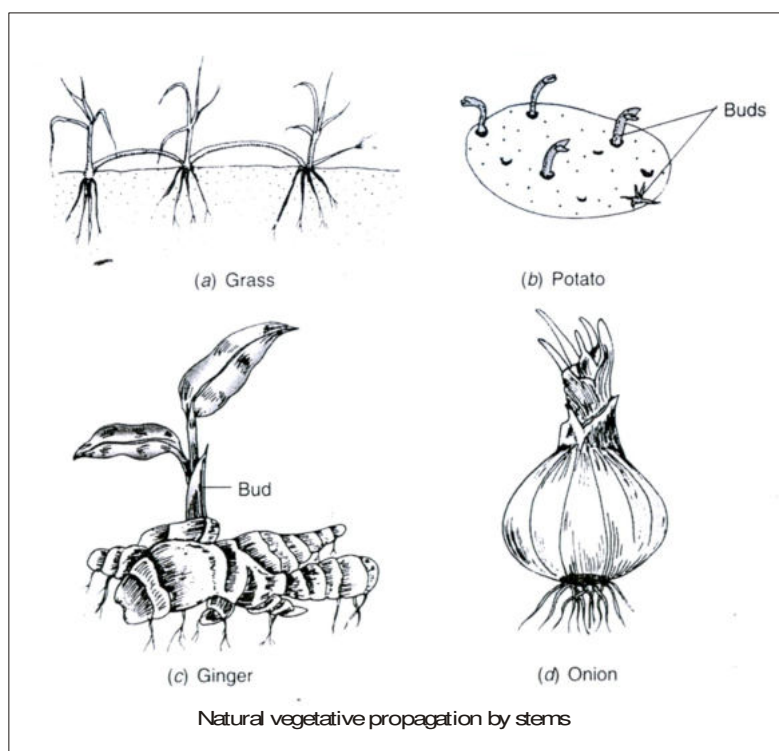


Fig.7

HOW DO ORGANISMS REPRODUCE

- **By roots :** Roots produce adventitious buds which develops into new plants. e.g sweet potato.

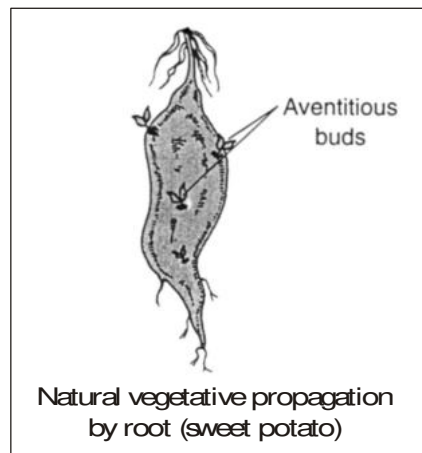


Fig.8

(B) Artificial vegetative propagation :

To prepare plants with desirable characters.

These are of four types.

(i) Cutting :

In this method small part of plant is cut and buried partly in the moist soil then cutting develops roots and grows into a new plant. e.g. Rose, Sugarcane, Potato, Cactus.

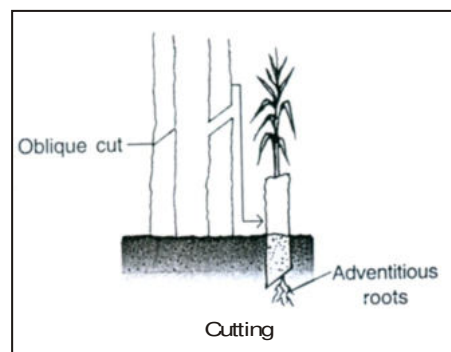


Fig.9

(ii) Grafting :

Two plants of closely related varieties are joined together so that they live as one plant.

The plant of which roots remain in the soil is called as **stock**.

Cutting part of a plant that is grafted on the other rooted plant is called **scion**.

e.g. Mango, Apple, Lemon.

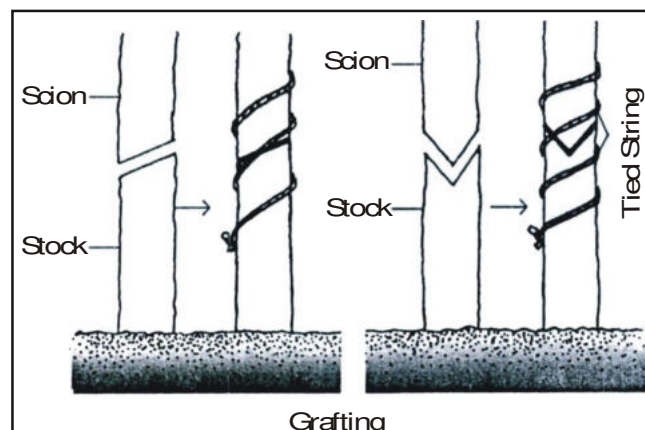


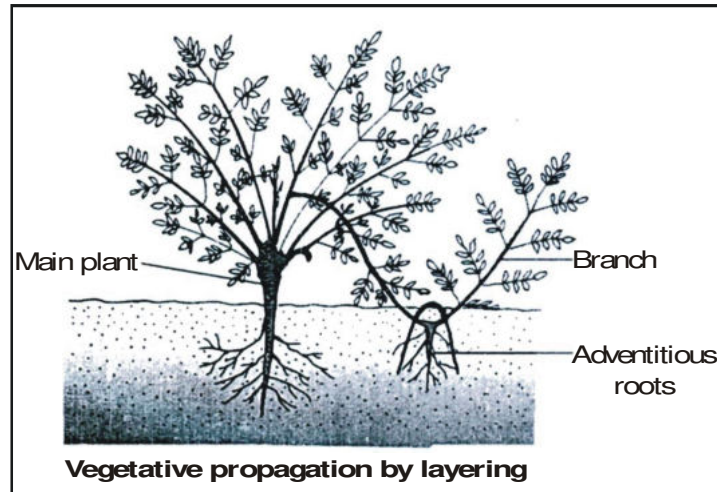
Fig.10

(iii) Layering :

In this method a branch of the parent plant is buried in the soil.

The portion of the branch which is in contact with the soil produces roots and this rooted branch is called **layer**.

Layer is then detached from the parent plant and act as a new plant. **e.g.** Jasmine, *Hibiscus*.

**Fig.11****(iv) Tissue culture or micropropagation :**

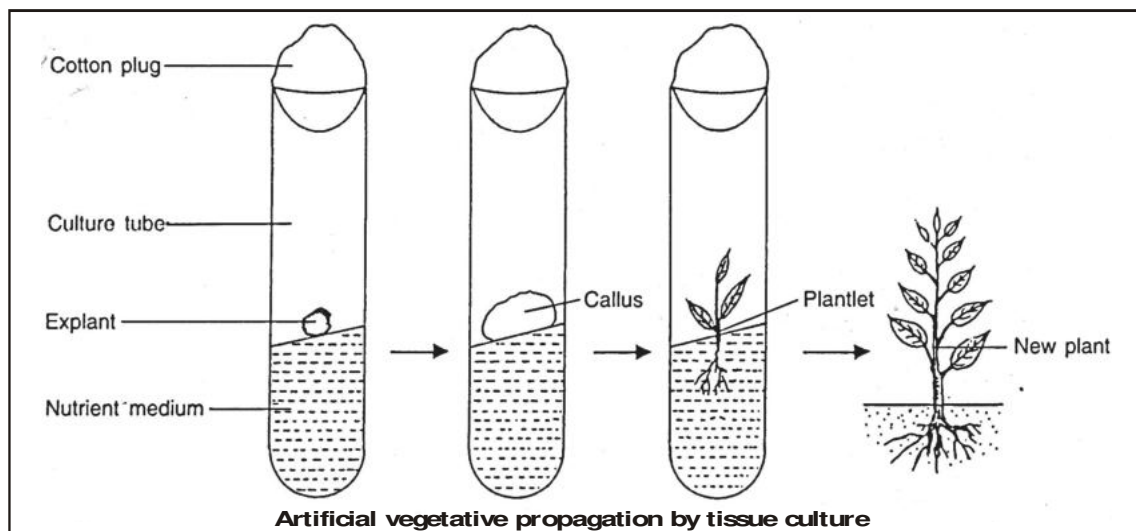
Cells or tissue which is isolated from the growing tip of plant called **explant**.

The explant develops into undifferentiated mass of cells called **callus** in the proper culture medium.

The callus is transferred to another medium containing hormones for growth and differentiation, that forms **plantlet**.

The plantlets are transplanted into pot or soil to form mature plant.

This technique is known as micropropagation. **e.g.** Orchids, *Chrysanthemum*.

**Fig.12****ADVANTAGES OF VEGETATIVE PROPAGATION**

It is a rapid, cheap and easy method of reproduction for the multiplication of plants.

Disease free plants can be produced.

Superior quality fruits or flowers can be produced by grafting.

Genetically identical plants are produced.



HOW DO ORGANISMS REPRODUCE

Plants raised by vegetative propagation can bear flowers and fruits earlier than those produce from seeds.

A Little further 1.3

Why are vegetative propagation favored for growing same kind of plants?

Explanation

There are several reasons for which vegetative propagation is favoured.

They are as follows : Either they do not produce seeds or their seeds are not viable.

Their qualities are good and we want to preserved these qualities.

Advantages of asexual reproduction

1. It is only method of reproduction in most unicellular organisms.
2. The parental properties are preseved.
3. It is rapid method. Only one individual is enough.
4. It does not require any sexual maturation, production of gametes, transfer of gamete and their fusion.
5. Number of methods available, according to convenience any method can be adopted.

(2) Sexual reproduction :-

It is a type of reproduction in which two different sexes (male and female) are involved. It involves the fusion of gametes from two different parents and results in the formation of new organism, which is genetically different from the parent.

Differences between asexual and sexual reproduction			
S. No.	Features	Asexual reproduction	Sexual reproduction
1	Number of parents involved	One	Two
2	Resemblance with parents	Organisms produced resemble exactly with the parent.	Organisms do not resemble exactly with the parent but resemble in certain features with both the parents.
3	Type of cell divisions	Amitotic / mitotic.	Mitotic and meiotic both are present.
4	Time duration for multiplication	Takes less time.	Takes more time.
5	Variations	Variations are absent.	Variations are present.
6	Adaptability	Organisms produced have less adaptability.	Organisms produced have more adaptability.
7	Examples	Fission, budding, vegetative propagation.	Human beings, higher plants.

SEXUAL REPRODUCTION IN FLOWERING PLANTS

Sexual reproduction takes place through the agency of flowers in angiosperms (flowering plants).

Flower is a specialized condensed reproductive shoot of flowering plants on which the essential reproductive parts are inserted.

A typical flower has four whorls arranged on the **thalamus**.

- | | | |
|---------------|---|----------------------|
| 1. Calyx | } | Non essential organs |
| 2. Corolla | | |
| 3. Androecium | } | Essential organs |
| 4. Gynoecium | | |

1. CALYX

It is the outermost whorl consisting of **sepals**.

Sepals are green and leaf like structure.

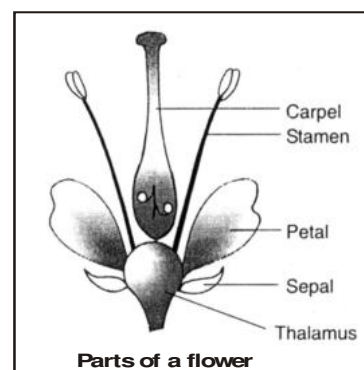


Fig.13



Calyx protect the flower bud before it opens.

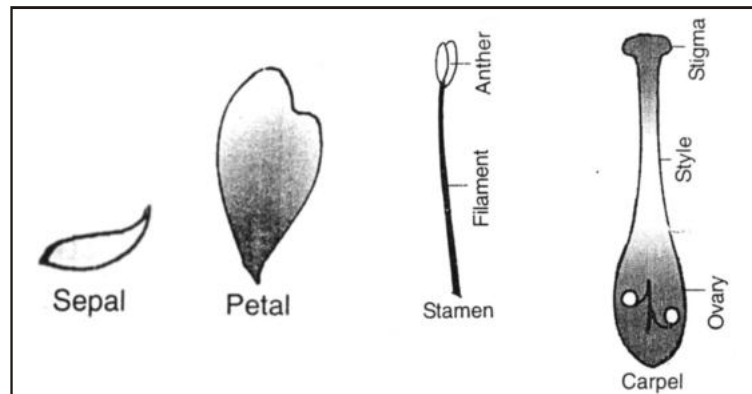


Fig.14

2. COROLLA

It is the second whorl, inner to calyx, consisting of **petals**.

Petals are generally large, coloured and showy.

Corolla attract insects for pollination.

3. ANDROECIUM

It is the third whorl, inner to corolla, consisting of male reproductive parts called **stamens**.

Each stamen has two parts – Filament and anther.

Anther is lobed structure present at the tip of filament. Each anther has pollen sacs (microsporangia) which contain pollen grains (microspores).

Each pollen grain produces two male gametes/ male germ cells.

4. GYNOECIUM

It is the fourth and innermost whorl consisting of **carpels**.

Carpel is present in the centre of flower.

Each carpel has three parts – Ovary, Style and Stigma.

Ovary is a swollen basal part of carpel. It contains ovules which are attached to placenta.

Each ovule contain an embryo sac that bears a haploid egg (female gamete).

Style is the middle part of the carpel. It has stigma above it and ovary below it.

Stigma is the apical part of carpel. It receives pollen grains.

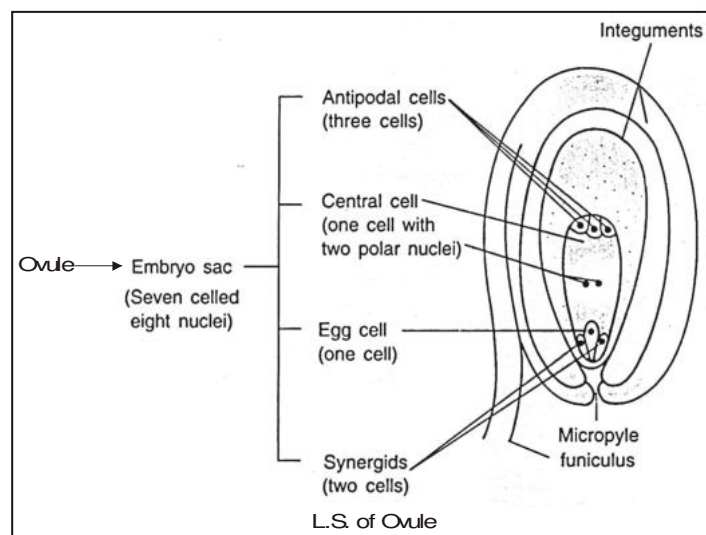


Fig.15



ON YOUR TIPS



Perianth :- If both sepals and petals are coloured and can not be distinguished from each other, then their whorl is known as **perianth**.

Perianth :- If both sepals and petals are coloured and can not be distinguished from each other, then their whorl is known as **perianth**.

Calyx and corolla are non essential parts of the flower because they are not directly involved in reproduction.

Bisexual flower :- When the male and female reproductive parts are present in the same flower are called bisexual flower e.g. **Hibiscus**, Mustard.

Unisexual flower :- When the male and female reproductive parts are present in different flowers.
e.g. : Papaya, Date palm, Mulberry, Gourd, Water melon.

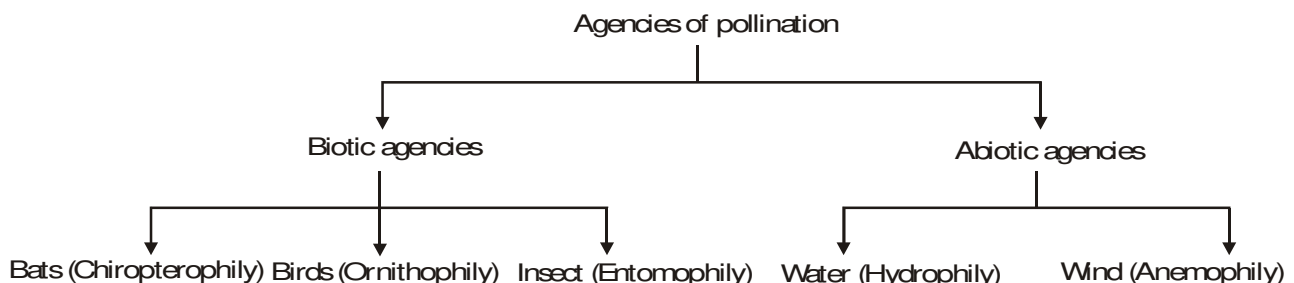
POLLINATION

Process in which pollen grains are transferred from the ripe anther to the stigma. It is of two types :

(i) Self pollination :- It is the transfer of pollen grains from an anther to the stigma of the same plant. If it is in the same flower it is called **autogamy** (e.g. **Pea**) and if it is between flowers of the same plant then it is called **geitonogamy** (e.g. **Oxalis**).

(ii) Cross pollination :- It is the transfer of pollen grains from anther to the stigma of different plants of the same species (e.g. Mango).

Agencies of pollination :- Transfer of pollen from one flower to another is achieved by agents like wind, water, animals, insects and birds.



Significance of bright colour of flower :- The bright colour of flowers is meant to attract insects which help in pollination. White colour shine in dark which attracts insects at night. Similarly, bright colour day-blooming flowers attract insects.

FERTILIZATION

Fertilization is the process of fusion of the male and female gametes, which takes place in the **embryo sac** present in the ovule.

After pollination, pollen grains germinate on the stigma by producing pollen tube.

The nucleus in the pollen tube divides into two male gametes.

Pollen tube penetrates the stigma and passes through the style and enters the ovule through micropyle. It releases two male gametes in embryo sac.

One male gamete fuses with egg cell and second male gamete fuses with the two polar nuclei.

One male gamete + Egg cell $\xrightarrow{\text{Syngamy}}$ Zygote.

Second male gamete + Two polar nuclei $\xrightarrow{\text{Triple fusion}}$ Triploid nucleus (Primary Endosperm Nucleus)

Syngamy + Triple fusion = Double fertilization.



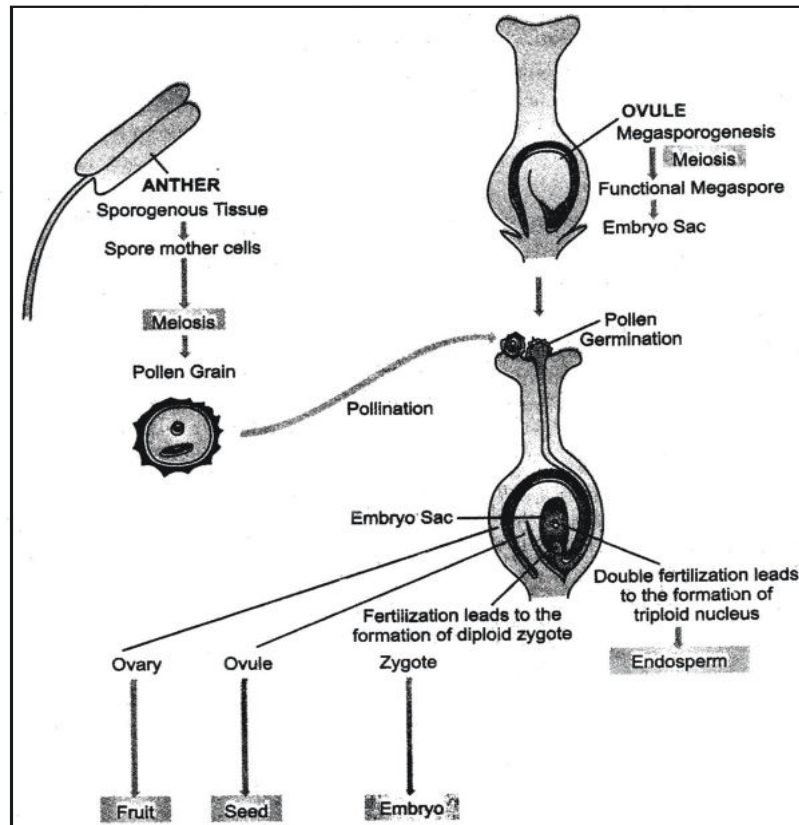
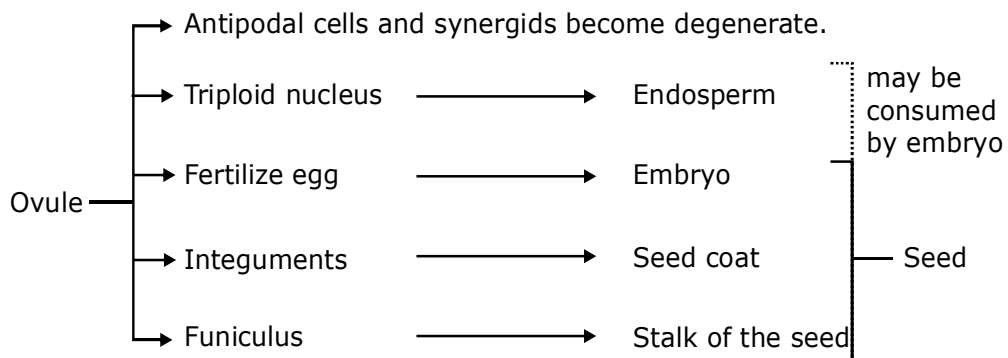


Fig.16

POST FERTILIZATION CHANGES IN THE FLOWER

- Sepals, petals and stamen withers off.
- Style and stigma degenerates.
- Ovary develops into fruit.
- Ovule grows into seed.



Seed : Seeds are formed from ovule of a flower, it contains an embryo formed by repeated division of zygote, it is covered by seed coat which is formed from integuments. The endosperm are responsible for storage of food for growing embryo. Seeds develop into a seedling in appropriate conditions.

Endospermic seed : If endosperm is not consumed.

Non endospermic seed :- Endosperm may be consumed.

Reproduction resulting from the fusion of male gamete and female gamete is called **sexual reproduction**.

OR

The type of reproduction in which fusion of male gamete & female gamete occur is called **sexual reproduction**.



Important features of sexual reproduction are given below :

- (i) It involves two different parents i.e. one male and one female.
- (ii) Each parent produces gametes.
- (iii) Male gametes are called **sperms** while female gametes are called **ova** or **eggs**.
- (iv) The fusion of male and female gametes is called **fertilization**. It results in to the formation of a single diploid cell **zygote**.
- (v) The zygote undergoes repeated mitotic divisions to form embryo which differentiate to form full organism.
- (vi) The organism produced in this type of reproduction are genetically different from both the parents and can resemble in certain features with parents.

HUMAN REPRODUCTIVE SYSTEM

Puberty :- The age at which the gametes and sex hormones to be produced and the boy and girl become sexually mature is called **puberty**.

Generally **female** pubertal age is **10-12 years**, **male** pubertal age is **13-14 years**.

Pubertal Changes (Secondary Sexual Characters) in Male :

Widening of shoulders.

Deepening of voice.

Growth of hairs under chest, armpits and around pubic area.

Appearance of beard and moustaches.

Growth of sex organs, [Testes & Penis].

Increased Activity of sweat and sebaceous glands.

Oily skin and appearance of pimples.

Darkening in skin colour of the genital area.

Pubertal Changes (Secondary Sexual Characters) in Female :

Widening of pelvis and hips.

High pitch voice

Growth of hairs under armpits and around pubic area.

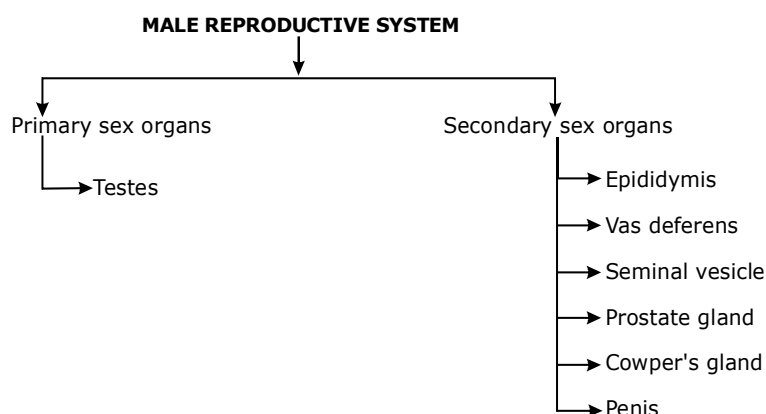
Initiation of menstrual cycle.

Growth of mammary glands (breasts).

Darkening in skin colour of genital area.

Maturation of secondary sex organs like fallopian tubes, uterus.

Male Reproductive System



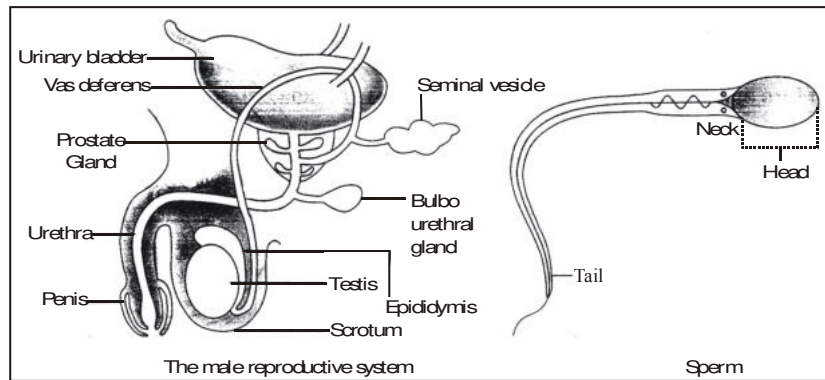


Fig.17

The male reproductive system consists of portions which produce the germ-cells and other portions that deliver the germ-cells to the site of fertilisation.

The formation of germ-cells or sperms takes place in the **testes**. These are located outside the abdominal cavity in **scrotum** because **sperm formation requires a lower temperature [1–3°C] than the normal body temperature**.

Testes secrete male sex hormone called **testosterone**.

In addition to regulating the formation of sperms, testosterone brings about changes in appearance seen in boys at the time of puberty. These changes are called **secondary sexual characters**.

The sperms formed are delivered through the vas deferens which unites with a tube coming from the urinary bladder. The urethra thus forms a common passage for both the sperms and urine. Hence urethra is also known as **urinogenital tract**.

Along the path of the vas deferens, glands like the **prostate gland** and the **seminal vesicle** add their secretions so that the sperms are now in a fluid which makes their transport easier and this fluid also provides nutrition.

The sperms are tiny bodies that consist of mainly genetic material and a long tail that helps them to move towards the female germ-cell (ovum).

Female Reproductive System

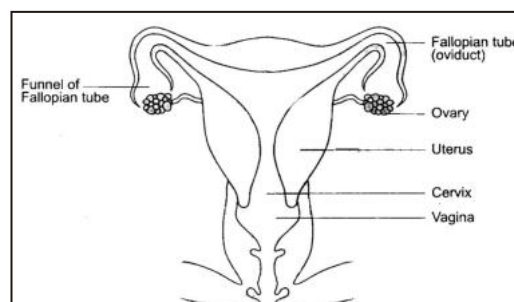
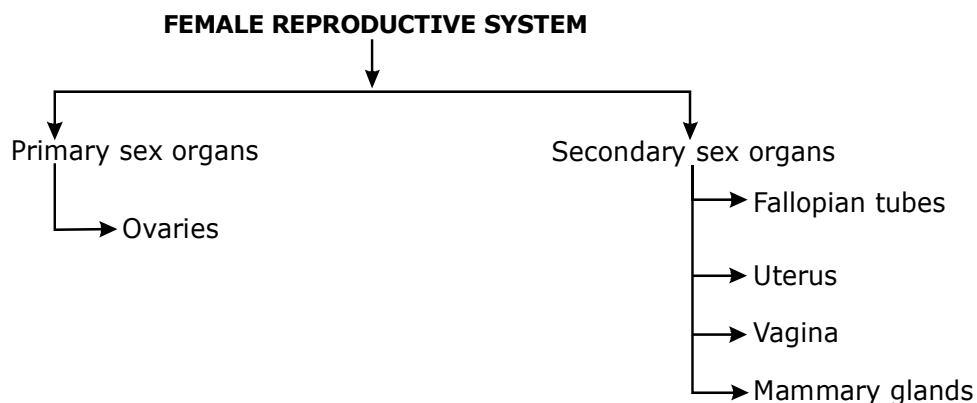


Fig.18

HOW DO ORGANISMS REPRODUCE

The female germ-cells or eggs are made in the ovaries. They are also responsible for the production of female sex hormones i.e., **Oestrogen** and **Progesterone**.

When a girl child is born, the ovaries already contain thousands of immature eggs. On reaching puberty, some of these start maturing.

One egg is produced every month by one of the ovaries.

The egg is carried from the ovary to the womb through a thin **oviduct** or **fallopian tube**.

The two oviducts unite into an elastic bag-like structure known as the **uterus**.

The uterus opens into the vagina through the **cervix**.

The sperms enter through the vaginal passage during sexual intercourse. They travel upwards and reach the oviduct where they may encounter the egg.

The fertilised egg (**zygote**) gets implanted in the lining of the uterus.

The mother's body is designed to undertake the development of the child. Hence the uterus prepares itself every month to receive and nurture the blood to nourish the growing embryo. The lining thickens and is richly supplied with blood to nourish the growing embryo.

The embryo gets nutrition from the mother's blood with the help of a special tissue called **placenta**. This is a disc which is embedded in the uterine wall. It contains **villi**. On the mother's side are blood spaces, which surround the villi. This provides a large surface area for glucose and oxygen to pass from the mother to the embryo.

The developing embryo will also generate waste substances which can be removed by transferring them into the mother's blood through the placenta. The development of the child inside the mother's body takes approximately **nine months**. The child is born as a result of rhythmic contractions of the muscles in the uterus, called **labour pain**.

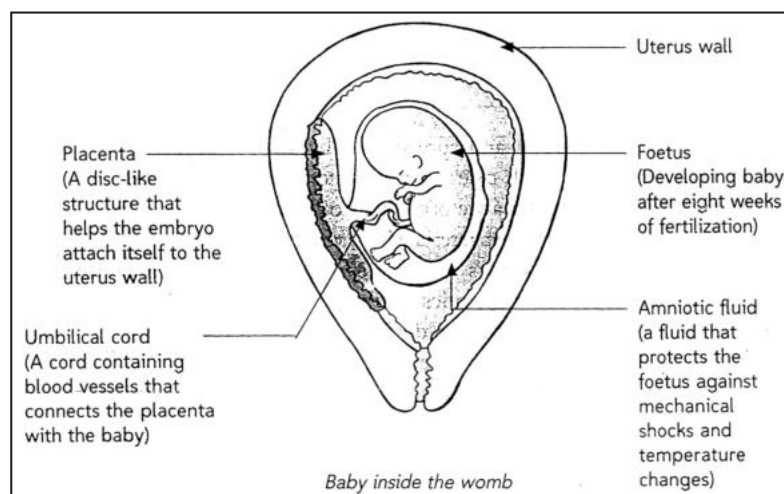


Fig.19

A Little further 1.4
What Happens When the Egg is not Fertilised ?
Explanation
If the egg is not fertilised, it lives for about one day.

Since the ovary releases one egg every month, the uterus also prepares itself every month to receive a fertilised egg. Thus its lining becomes thick and spongy. This would be required for nourishing the embryo if fertilisation had taken place.

This lining is not needed any longer. So, the lining slowly breaks and comes out through the vagina as blood and mucous. This cycle takes place roughly every month and is known as **menstruation**. It usually lasts for about two to eight days.



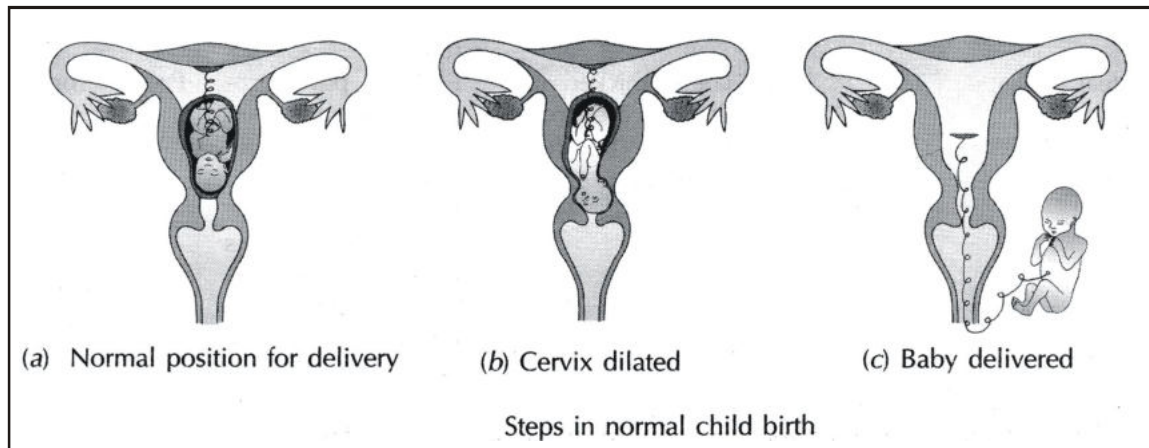


Fig.20

Reproductive Health :

Sexually Transmitted Diseases (STDs)

There are many infectious diseases which are spread by sexual contact, called **Sexually Transmitted Diseases (STDs)** e.g. AIDS, Hepatitis.

STDs occur mostly in the individuals who are involved in sexual activities with many partners.

Some common sexually transmitted diseases (STDs)			
S. No.	Name of STDs	Causal Organism	Symptoms
1	AIDS (Acquired Immuno Deficiency Syndrome)	HIV (Human Immuno Deficiency Virus)	Destroy the immune system of body. Persistent cough and fever. Body attacked by other diseases like pneumonia, T.B. and certain cancers.
2	Syphilis	<i>Treponema pallidum</i> (a bacterium)	Causes sores and lesions in the genital tract. Burning sensation at urination.
3	Gonorrhoea	<i>Neisseria gonorrhoeae</i> (a bacterium)	Infects mucous membranes of the urinogenital tract. Genital discharge, painful urination.
4	Trichomoniasis	<i>Trichomonas vaginalis</i> (a protozoan)	Vaginal irritation, itching and discharge.

Methods of prevention of STDs :

- The people should be educated about various STDs.
- Extra marital relations should be avoided.
- No sex without proper precaution.
- High standard of moral education should be given to the people.

Methods adopted for population control :- The prevention of pregnancy in women is called **contraception**.

1. Planned control of population :

- By education people about the advantages of small family
- Raising the age of marriage can help in reducing population growth.
- By family planning.

2. Natural method :-

- Intercourse is safe for a week before and week after menstruation.
- Coitus interruptus involves withdrawing penis before ejaculation.



3. Mechanical methods :

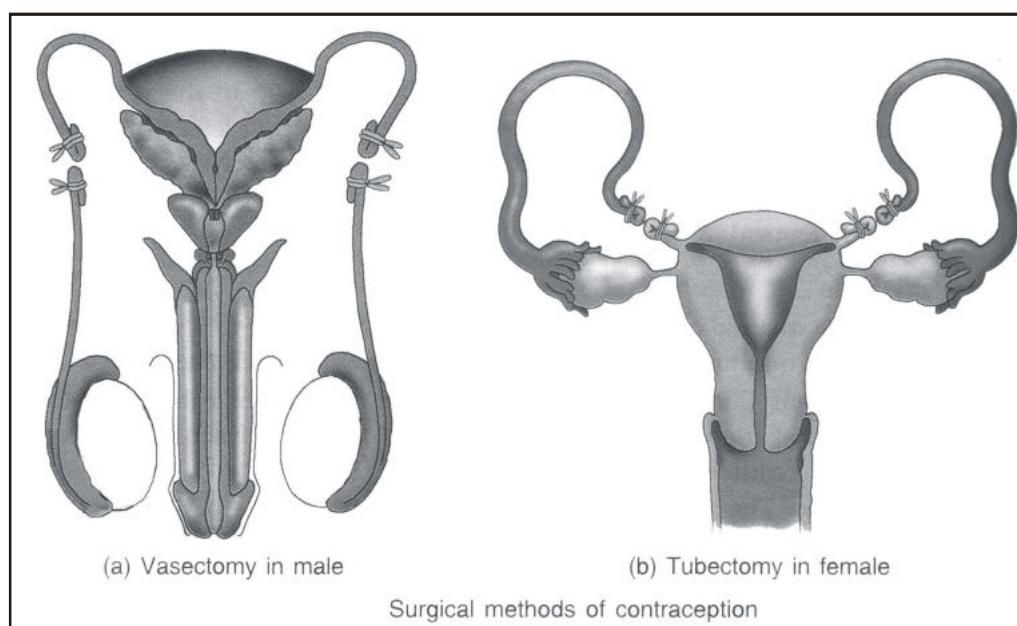
- (i) It includes use of condoms which are the rubber or plastic sheets put on the penis before coital activity.
- (ii) Use of **diaphragms** or **cervical caps** fitted in vagina of female to check the entry of sperms into the uterus and also helps in avoiding conception.
- (iii) Use of **IUCD** i.e., **Intra Uterine Contraceptive Devices** like **copper-T** and **loops** fitted in the uterus, help to prevent fertilization. They can cause side effects due to irritation of uterus.

4. Chemical methods :

- (i) It consists of using some chemicals which are **spermicidal**. They may be in form of tablets, jellies, paste and creams introduced in the vagina before coital activity.
- (ii) Another chemical method is the use of **oral contraceptive (OC) pills** which inhibit the secretion of FSH and LH from the anterior lobe of pituitary gland and thus inhibiting ovulation from the ovary. These contraceptive therefore change the hormonal balance so that egg cell are not released and hence prevent fertilization.

5. Surgical methods :

- (i) **Tubectomy** involves cutting of fallopian tubes in females and **Vasectomy** involves cutting of vas deferens of each side.
- (ii) Removal of ovaries surgically is known as **ovariectomy** and removal of testes is known as **castration**.
- (iii) Another surgical method is **MTP** i.e. Medical Termination of Pregnancy or abortion.
- (iv) Other method is **tubal ligation** in which fallopian tubes are blocked by an instrument called **laproscope**.

**Fig.21**

After fertilization, membrane appears around the egg to prevent further entry of sperms. It is called **monospermy**. After the entry of sperm, ovum completes its maturation division.

Amniocentesis

Amniocentesis is a prenatal diagnostic technique to determine the genetic disorders, if any, of the foetus. Unfortunately, the useful technique of amniocentesis is being misused to kill the normal female foetuses as it can help to detect the sex of foetus also. Determination of sex by amniocentesis has been banned.

N.C.E.R.T TEXT BOOK SOLUTION

Q.1 What is the importance of DNA copying in reproduction.

Ans. DNA copying is the basic event of reproduction through which genetic information of the parents pass to the offspring. DNA contains information for inheritance of traits from one generation (parents) to next generation. It maintains basic body design of the species and also produces variations due to linkage and crossing over. These variations may be beneficial for the survival of species over time.

Q.2 Why is variations beneficial to the species origin but not necessarily for the individual?

Ans. The population of an organism lives in close association with their environment. Any change in the environment or variations affect the population in either way. Individually, these variations may not be of much benefit to a particular organism but when a species faces a drastically altered condition, few individuals of species may survive under extreme conditions of change in temperature and varying water level, etc. These surviving individuals may reproduce and develop a more adapted population. Thus, variations are beneficial to the species from becoming extinct and promote survival for longer time.

Q.3 How does binary fission differ from multiple fission?

Ans. In binary fission, the parent cell splits up into two daughter individuals of nearly equal size whereas in multiple fission, several small daughter individuals are formed generally in unfavourable conditions.

S.No.	Parameter	Binary fission	Multiple fission
1	Daughter individuals	Two individuals are formed.	Several individuals are formed.
2	Condition	Occurs during favourable conditions	Occurs during both favourable and unfavourable conditions
3	Division of nucleus	Nucleus of parent cell divides only once	Nucleus of parent cell divides repeatedly
4	Division of cytoplasm	After each nuclear division cytoplasm divides.	After each nuclear division cytoplasm does not divide
5	Cyst formation	No protective covering (cyst) is formed around the organism.	Protective covering (cyst) is formed during multiple fission.
	Examples	Amoeba, Paramecium, bacteria	Plasmodium, Amoeba (encysted)

Q.4 How will an organism be benefitted if it reproduces through spores?

Ans. Sporulation or spore formation is a method of asexual reproduction in which each individual produces a large number of spores inside sporangia. The spores on germination form new individuals, for example, *Rhizopus*. These are beneficial for organisms in following ways:

- (i) Spores are widely dispersed by wind.
- (ii) A large number of organisms are produced from a single parent through sporulation.
- (iii) Spores are covered by thick wall which help them to withstand unfavourable conditions of environment.
- (iv) Spores are small and light, thus easily dispersed through wind, water and animals.

Q.5 Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?

Ans. Complex organisms have several kind of specialised organs and organ systems. They have less number of undifferentiated cells so the power of regeneration is limited and only restricted to certain cells. For example, stem cells can form some tissue and organs but not the complete individual.



HOW DO ORGANISMS REPRODUCE

Q.6 Why is vegetative propagation practised for growing some types of plants?

Ans. Vegetative propagation is practised for growing certain types of plants due to following reasons:

- (i) Vegetative propagation is applied in plants which have lost the capacity to produce seeds or do not produce viable seeds, e.g., banana, rose, jasmine.
- (ii) Plants propagated through vegetative propagation are genetically similar to parent plant so characters of plants can be preserved through generations.
- (iii) Through cutting and grafting, flowers and fruits are grown in shorter duration.
- (iv) It is cheaper, rapid and easier method of propagation.

Q.7 Why is DNA copying an essential part of the process of reproduction?

Ans. DNA copying is an essential part of the process of reproduction because reproduction is the process of producing new individuals from the pre-existing individuals of the same species. Cell multiplication cannot occur without DNA replication or DNA copying. The exact blue prints of body design is inherited to offspring due to DNA replication in parent cell.

Q.8 How is the process of pollination different from fertilisation?

Ans. Pollination is the transfer of pollen grains from anther to stigma of the flower whereas fertilisation is the fusion of male and female gametes to form zygote (2X).

S.No.	Parameter	Pollination	Fertilisation
1	Process	It is transfer of pollen grains from the anther to stigma of a flower.	It is the fusion of male and female gametes.
2	Types	It is a physical process.	It is a physio-chemical or biological process.
3	Occurrence	It occurs only in seed plants (phanerogams).	It occurs in both plants and animals.
4	Purpose	It transmits the male gamete to the female sex organ.	It brings about fusion of male and female gametes.

Q.9 What is the role of these seminal vesicles and the prostate gland?

Ans. Seminal vesicles secrete 60-70% of alkaline semen plasma having fructose, proteins and prostaglandins. Prostaglandins cause movements of sperms and fructose gives nourishment. Seminal vesicles also store sperms temporarily. Prostate gland produces 20-30% of semen plasma that is alkaline and viscous. It also helps in sperm motility.

Q.10 What are the changes seen in girls at the time of puberty?

Ans. At puberty, the females observe following changes:

- (ii) growth of breast
- (ii) broadening of pelvis and hip region
- (iii) development of external genitalia
- (iv) beginning of ovulation and menstruation
- (v) increase in fat, particularly in thighs, shoulders, buttocks and face
- (vi) development of pubic hairs

Q.11 How does the embryo get nourishment inside the mother's body?

Ans. The embryo gets nourishment in the mother's body through placenta. Many finger-like villi from the chorion of placenta covers the embryo which take part in diffusion of nutrients from mother's blood to embryo.



HOW DO ORGANISMS REPRODUCE

Q.12 If a woman is using a copper-T, will it help in protecting her from sexually transmitted diseases?

Ans. No, because copper-T does not prevent the entry of male fluid in the female tract which may carry disease causing microorganisms. It is an intra-uterine device to prevent unwanted pregnancy.

Q.13 What are the advantages of sexual reproduction over asexual reproduction?

Ans. Sexual reproduction has following advantages over asexual reproduction. These are as follows:

- (i) In sexual reproduction, male and female gametes fuse to form zygote. Since the two gametes come from two different and sexually distinct individuals, the offspring exhibit diversity of characters. Variations are the raw materials for evolution (origin of new species).
- (ii) It involves meiotic division during gamete formation and plays a prominent role in formation of new combinations that lead to origin of new species.

Q.14 What are the functions performed by the testis in human beings?

Ans. Testes perform two functions (i) production of male gametes, i.e., sperms and (ii) production of male sex hormones, i.e., testosterone that controls normal growth of sex organs and also development of secondary sexual characters.

Q.15 Why does menstruation occur?

Ans. When the egg is not fertilised, progesterone level starts decreasing. As a result, nourishment to endometrium is stopped which causes its rupture. The discharge of unfertilised egg along with ruptured endometrium and some mucus is called vaginal bleeding or menstruation.

Q.16 Draw a labelled diagram of the longitudinal section of a flower.

Ans. Refer to text.

Q.17 What are the different methods of contraception?

Ans. (i) Barrier methods - condoms, cervical caps or diaphragm, implants and IUDs
(ii) Chemical methods - oral pills, creams, jellies, foaming tablets (vaginal pills)
(iii) Surgical methods - vasectomy and tubectomy
(iv) Natural methods - abstinence, rhythm method and coitus interruptus.

Q.18 How are the modes of reproduction different in unicellular and multicellular organisms?

Ans. Unicellular organisms reproduce generally by asexual mode of reproduction like fission or budding, however some forms exhibit primitive type of sexual reproduction like conjugation and formation of gametes. Multicellular organisms have complex body structure, made up of tissue, organs and organ systems. So they reproduce generally by complex ways of sexual reproduction, however some primitive multicellular organisms reproduce through asexual methods like budding, regeneration, spore formation and vegetative propagation.

Q.19 How does reproduction help in providing stability to population of species?

Ans. Reproduction enables an organism to increase its number. Stability of population is attained when the rate of birth is approximately equal to rate of death. So, through reproduction the population increases its size (number) and compensates for the dead organisms and maintains its stability.

Q.20 What could be the reasons for adopting contraceptive methods?

Ans. Contraceptive methods are generally adopted due to
(i) prevent unwanted conception
(ii) to keep a check on population explosion
(iii) improve standard of living
(iv) pave sufficient gap between successive birth of child
(v) protection from sexually transmitted diseases (STDs)



EXERCISE – I**NTSE /OLYMPIAD /FOUNDATION PROBLEMS****OBJECTIVE QUESTIONS**

1. Vegetative propagation in *Bryophyllum* takes place by :-
(A) stem (B) leaf (C) root (D) none of these
2. The group of petals is called :-
(A) sepals (B) calyx (C) root (D) None of these
3. During grafting, the portion of plant that is grafted is called :-
(A) stock (B) scion (C) stalk (D) stem
4. In roses, the method commonly used to produce new plants is :-
(A) tissue culture (B) cutting (C) layering (D) None of these
5. Pollen grains are produced by :-
(A) ovary (B) anther (C) stigma (D) petal
6. Which one is applicable to insect pollinated flowers :
(A) Flowers are very small produced in large quantities.
(B) Flowers are not prominent and without nectar.
(C) Flowers are conspicuous and scented having nectar.
(D) None of these
7. The group of sepals is called :-
(A) gynoecium (B) calyx (C) corolla (D) androecium
8. Maize is :-
(A) self pollinated (B) cross pollinated by rain
(C) cross pollinated by insects (D) cross pollinated by wind
9. Which of the following produces male gametes in a flower :-
(A) sepals (B) petals (C) carpels (D) stamens
10. During pollination, pollen grains get carried to which part of the carpel ?
(A) Ovary (B) Stigma (C) Ovule (D) Style
11. Binary fission occurs in :
(A) *Amoeba* (B) *Paramecium* (C) *Planaria* (D) A & B both
12. Which one of the following is concerned with asexual reproduction ?
(A) Zygote (B) Spores (C) Gametes (D) Gonads
13. Which type of reproduction of *Hydra* is most common ?
(A) Budding (B) Fragmentation
(C) Sexual reproduction (D) Gametogenesis
14. The most fundamental characteristics of living being :-
(A) Locomotion (B) Regeneration (C) Fragmentation (D) Reproduction
15. Multiple fission occurs in :-
(A) *Hydra* (B) *Plasmodium* (C) *Planaria* (D) All of these



HOW DO ORGANISMS REPRODUCE

FILL IN THE BLANKS :

1. In *Rhizopus* asexual reproduction takes place by formation.
2. In *Bryophyllum* vegetative propagation takes place through their
3. The process in which new organisms are formed by existing organism is called
4. In *Spirogyra*, asexual reproduction, takes place by
5. Natural vegetative propagation takes place in sweet potato by
6. In method a branch of parent plant is buried in the soil.
7. In method a cutting part of a plant is grafted on the other plant part.

ANSWER KEY

OBJECTIVE QUESTIONS

- | | | | | | | |
|-------|------|-------|-------|-------|-------|-------|
| 1. B | 2. D | 3. B | 4. B | 5. B | 6. C | 7. B |
| 8. D | 9. D | 10. B | 11. D | 12. B | 13. A | 14. D |
| 15. B | | | | | | |

FILL IN THE BLANKS

- | | | | |
|----------|-------------|-----------------|------------------|
| 1. spore | 2. leaf | 3. reproduction | 4. fragmentation |
| 5. root | 6. layering | 7. grafting | |



EXERCISE – II**PRACTICE FOR SUMMATIVE ASSESSMENT****VERY SHORT TYPE QUESTIONS :**

1. Where does fertilization take place ?
2. What is a foetus ?
3. How is an embryo produced ?
4. What is a zygote ?
5. Write three examples of animals in which external fertilization occur.
6. Draw a labelled diagram of male reproductive system.
7. Name the parts present in human sperm. Show by labelled diagram.
8. What is syngamy ?
9. What is the name given to primary sex organs ?
10. What are copulatory organs ?

SHORT TYPE QUESTIONS :

1. What methods will you use for growing jasmine and rose plant ?
2. Leaves of *Bryophyllum* fallen on the ground produce new plants whereas the leaves of rose do not. Why?
3. What are the two possibilities of self-pollination ?
4. List two main advantages of sexual reproduction.
5. 'Grafting is a common method of obtaining a superior plant from two different plants'. Explain.

LONG ANSWER TYPE QUESTIONS :

1. Define the terms unisexual flower and bisexual flower giving one example of each.
2. Explain double fertilisation in plants.



FOR SCHOOL EXAMS.

EXERCISE-III

SECTION-A

• Fill in the blanks

1. In _____ a bud develops as an outgrowth due to repeated cell division at one specific site.
2. After fertilisation the _____ divides several times to form an embryo within the ovule.
3. The sperm formed in testes are delivered through the _____ which unites with a tube coming from urinary bladder.
4. Child sex ratio is declining at an alarming rate in some sections of our society, due to female _____.
5. Chromosomes in the nucleus of a cell contain information for inheritance of features from parents to next generation in the form of _____.

SECTION-B

• Multiple choice question with one correct answers

1. Multiple fission is found in:
(A) Amoeba (B) Plasmodium (C) Both (D) None
2. Synergids are:
(A) haploid (B) diploid (C) triploid (D) tetraploid
3. Fertilization in angiosperms is the:
(A) fusion of two dissimilar flowers (B) union of stamens of unequal length
(C) fusion of dissimilar gametes (D) fusion of two similar spores.
4. Syngamy refers to:
(A) fusion of one of the sperms with secondary nucleus
(B) fusion of one of the sperms with the egg
(C) fusion of one of the sperms with the egg and other with the secondary nucleus
(D) fusion of one of the sperms with synergids.
5. Cowper's glands are present in:
(A) female mammals (B) male mammals (C) both (A) and (B) (D) none of the above
6. When a mature egg leaves the ovary, it enters the:
(A) follicle (B) endometrium (C) interstitial cells (D) oviduct
7. The endometrium is the lining of :
(A) bladder (B) vagina (C) uterus (D) oviduct
8. Progesterone hormone is produced by:
(A) germinal epithelium of ovary (B) follicular cells
(C) corpus luteum (D) none of the above
9. After ovulation, endocrine part of the ovary is:
(A) corpus callosum (B) corpus albicans (C) corpus spongiosum (D) corpus luteum
10. Inner lining of uterus is
(A) Myometrium (B) Perimetrium (C) Endometrium (D) All of these
11. Which of the following is the correct sequence of hormonal increase beginning from menstruation?
(A) Estrogen, progesterone, FSH (B) FSH, progesterone, estrogen
(C) FSH, estrogen, progesterone (D) estrogen, FSH, progesterone.

SECTION-C

• Multiple choice question with one or more than one correct answers

1. Asexual reproduction takes place through budding in
(A) Amoeba (B) Yeast (C) Hydra (D) Plasmodium
2. Stamen contains



HOW DO ORGANISMS REPRODUCE

- | | | | |
|------------|--------------|-------------|------------|
| (A) Anther | (B) Filament | (C) Pollens | (D) Carpel |
|------------|--------------|-------------|------------|
3. Which of them are a type of fertilization
- | | | | |
|-------------|-------------------|--------------|--------------------|
| (A) Syngamy | (B) Triple fusion | (C) Apomixis | (D) Tissue culture |
|-------------|-------------------|--------------|--------------------|
4. Following is a contraceptive
- | | | | |
|--------------|------------|---------------|---------------|
| (A) Copper-T | (B) Condom | (C) Diaphragm | (D) Ovulation |
|--------------|------------|---------------|---------------|
5. Agents of cross pollination are
- | | | | |
|---------|-----------|------------|-------------|
| (A) Air | (B) Water | (C) Insect | (D) Animals |
|---------|-----------|------------|-------------|

SECTION-D

• Assertion & Reason

Instructions: In the following questions an Assertion (A) is given followed by a Reason (R). Mark your responses from the following options.

- (A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'
(B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'
(C) Assertion is true but Reason is false
(D) Assertion is false but Reason is true

1. **Assertion:** Bryophyllum shows vegetative propagation
Reason: Propagation may be artificial or natural.
2. **Assertion:** If each new generation is to be the combination of the DNA copies from two pre-existing individuals, then each new generation will end up having twice the amount of DNA.
Reason: DNA is a genetic material in humans

SECTION-E

• Match the following (one to one)

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. Only one entry of column-I may have the matching with the same entries of column-II and one entry of column-II only one matching with entries of column-I

1. **Column I**

- (A) Rhizobium
(B) Rhizopus
(C) Rhizoid
(D) Plasmodium

Column II

- (P) Multiple fission
(Q) Roots
(R) Bread mould
(S) N_2 fixing bacteria

2. **Column I**

- (A) Testis
(B) Ovary
(C) Egg
(D) Sperm

Column II

- (P) Female gamete
(Q) Male gonad
(R) Male gamete
(S) Female gonad

SECTION-F

• Comprehension

Passage-1

DNA is the source of information for making proteins. Any change in the information leads to production of different proteins, which ultimately lead to altered body designs. Basic event in reproduction is production of DNA copies in a reproducing cell. The process is called DNA replication. When the cell divides into two each new cell gets a copy of along with the whole cellular apparatus.

1. Name the organelle of a cell having our main DNA?
- (A) Nucleus (B) Vacuole



HOW DO ORGANISMS REPRODUCE

- (C) Chromosome (D) Plasma membrane
2. Which of the statement is correct
(A) Protein ® DNA ® RNA (B) DNA ® Protein ® RNA
(C) DNA ® RNA ® Protein (D) None of these
3. Sons are not exactly identical to their father due to
(A) Eating habit (B) Knowledge
(C) Error in DNA replication (D) All of these

Passage-2

Cyclic changes taking place in the reproductive organs of a non pregnant woman are termed as menstrual cycle. They take place if the ovum is not fertilized important events in sexual cycle of females are release of mature ovum from the ovary, degeneration and removal of inner thickest wall leaving the uterus along with blood after every 28 days.

1. Release of ovum from the ovary is called
(A) Ovulation (B) Oogenesis (C) Disintegration (D) Puberty
2. If a woman become pregnant then
(A) Menstrual cycle stops (B) Ova is not produced for 9 month
(C) Removal of inner thickened lining of uterus continues
(D) Both (A) and (B)

SECTION-G

• Match the following (one to many)

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the some entries of column-II and one entry of column-II may have one or more than one matching with entries of column-I

1. Column I

- (A) Sugar cane
(B) Rose
(C) Bacteria
(D) Plasmodium

Column II

- (P) Binary fission
(Q) Endospore formation
(R) Vegetative propagation
(S) Multiple fission

2. Column I

- (A) Amoeba
(B) Plasmodium
(C) Angiosperm
(D) Ovulation

Column II

- (P) Binary fission
(Q) Multiple fission
(R) Triple fusion
(S) Menstrual cycle



Answers

Section-A

1. Hydra
2. Zygote
3. Vas deferens
4. foeticides
5. DNA

Section-B

1. (C)
2. (A)
3. (C)
4. (B)
5. (B)
6. (D)
7. (C)
8. (C)
9. (D)
10. (C)
11. (C)

Section-C

1. (B,C)
2. (A,B,C)
3. (A,B)
4. (A,B,C)
5. (A,B,C,D)

Section-D

1. (A)
2. (B)

Section-E

1. (A)-(S), (B)-(R), (C)-(Q), (D)-(P)
2. (A)-(Q), (B)-(S), (C)-(P), (D)-(R)

Section-F**Passage-1**

1. (A)
2. (C)
3. (C)

Passage-2

1. (A)
2. (D)

Section-G

1. (A)-(R), (B)-(R), (C)-(P,Q), (D)-(S)
2. (A)-(PQ), (B)-(Q), (C)-(R), (D)-(S)



FOR OLYMPIAD

EXERCISE-IV

1. If the pollen is transferred to the stigma of the same flower, it is termed :-
(A) allogamy (B) geitonogamy (C) autogamy (D) all of these
2. Which part of the flower forms the fruit ?
(A) Whole flower (B) Only stamens and carpel
(C) Only ovary (D) Only carpel
3. In angiosperm after the fertilization endosperm become :-
(A) Haploid (B) Diploid (C) Triploid (D) Tetraploid
4. After fertilization ovule grows into :-
(A) seed (B) fruit (C) placenta (D) None
5. Which is not a part of carpel :-
(A) Stigma (B) Ovary (C) Anther (D) Style
6. Nucleus of the bud is formed by the division of :
(A) Meiosis (B) Amitosis (C) Mitosis (D) All of these
7. Clones are formed as a result of :
(A) Budding (B) Regeneration
(C) Vegetative propagation (D) All of them
8. Malarial parasite reproduces by :
(A) Multiple fission (B) Binary fission (C) Budding (D) Regeneration
9. The outgrowth of *Hydra* is termed as :
(A) Bulb (B) Bud (C) Daughter *Hydra* (D) Tentacles
10. Asexual reproduction takes place by the process of budding :
(A) *Plasmodium* (B) *Amoeba* (C) Yeast (D) *Rhizopus*
11. Asexual reproduction involves :
(A) Only one parent (B) Two parent (C) Meiosis and syngamy (D) Fusion of two gametes
12. Which is a part of stamen :-
(A) Stigma (B) Filament (C) Style (D) None

ANSWER KEY

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	C	C	C	A	C	C	D	A	B	C	A	B

